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Geomagnetism and Paleomagnetism

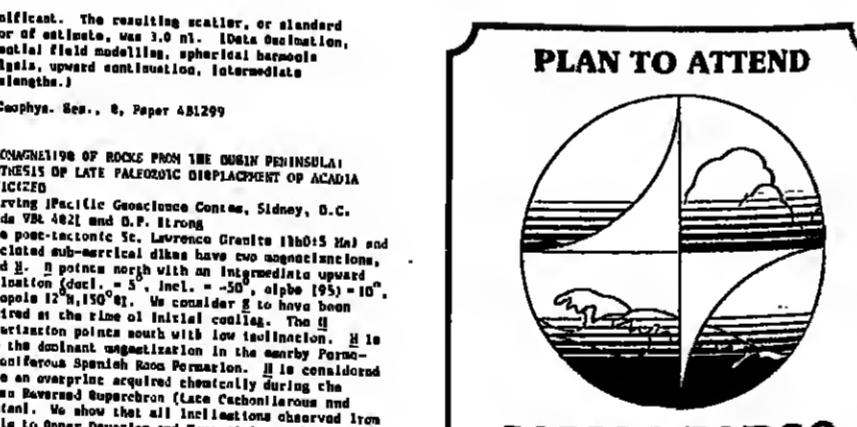
2539 Special Variations
VISCOUS REMANENT MAGNETIZATION AND THE
ROLE OF TECTONIC PLATE MOTION
B. David Johnson (Center for Geophysical Exploration Research, Monash University, North Ryde 2113, Australia)

A range of crystal models for the magnetization of viscous remanent magnetism have been constructed from bathymetric data. The source magnetizations are to be contrasted to directions of the present earth's field at the centers of the source regions. The model calculations are based on observations points of a selected set of magnetic anomalies, with a variable magnetic field direction calculated from the HDM(4/8) field model. A range of crystal models for the magnetization of viscous remanent magnetism have been constructed from bathymetric data. The source magnetizations are to be contrasted to directions of the present earth's field at the centers of the source regions. The model calculations are based on observations points of a selected set of magnetic anomalies, with a variable magnetic field direction calculated from the HDM(4/8) field model.

5560 PALEOMAGNETISM OF ROCKS FROM THE BUSHIN PENINSULA: CRITICAL TESTS FOR LATE PALaeoIC DISPLACEMENT OF ACADIA E. Irving (Pacific Geoscience Centre, Sidney, B.C., Canada V8L 4R2) and D.P. Irving

The paleo-tectonic St. Lawrence Granite (1805 Ma) and associated rocks from the Bushin Peninsula have two main magnetizations, N and S, a porphyro magnet with a low coercivity (dcl = 5° incl. = -50°, alpha 95% = 10°, magnetization 12°, 115°). We consider it to have been acquired during the early stages of the granite cooling. The N magnetization points south with a low coercivity (dcl = 5° incl. = -50°, alpha 95% = 10°). It is the dominant organization in the nearby Pennine-Carboniferous Spanish iron formation. It is considered to be overprinted magnetically during the Klondike River Super Group (Catoctin and Pennine). We show that all inclinations observed from the Klondike River Super Group are not significantly different either from the Klondike River Super Group or from the overprints observed from the Bushin Peninsula. We suggest, therefore, that the commonly accepted Late Devonian age for the Bushin granite in North America is either entirely Gleason in age or has been anomalously affected by Gleason overprinting. Consequently we conclude that arguments which use this reference point as a constraint for mapping much of the north-eastern Appalachians (which displaced 1500 km south relative to the craton in the late Devonian) are invalid.

J. Geophys. Res., 89, Paper 48129



IAMAP/IAPSO JOINT ASSEMBLY

AUGUST 5-16, 1985
HONOLULU, HAWAII

Coproposors:
American Geophysical Union
American Meteorological Society

Abstract Deadline:

March 15, 1985
(All abstracts must be submitted to IAMAP/IAPSO Joint Assembly, AGU, 2000 Florida Ave., NW, Washington, D.C. 20009)

Call for Papers:

Published in Eos,
September 11, 1984

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News

Solar Maximum Mission Highlights

Since the in-orbit repair of the Solar Maximum Mission (SMM) spacecraft, one of the notable discoveries reported is evidence of a 155-day cycle in the occurrence of high-energy solar flares. No pattern in these phenomena had been observed previously. High-energy flares are disruptive to the interplanetary solar wind and are thought to be responsible for geomagnetic storms.

Scientific results based on data from the Solar Maximum Mission (SMM) spacecraft since its repair in April by space shuttle astronauts will be highlighted at the AGU Fall Meeting in San Francisco, Calif., December 9-7, 1984. Eight presentations to be given on the morning of Monday, December 5 focus on the spacecraft's gamma ray observations, results from the hard X-ray burst spectrometer and hard X-ray imaging spectrometer, and coronal observations made with the coronagraph/polarimeter.

The SMM spacecraft was launched in February 1980 with an array of instruments designed to help scientists study the physics of solar flares. In November 1980 the spacecraft lost its ability to point accurately toward the sun, rendering some of its specialized instrumentation useless. In April 1984, astronauts aboard a space shuttle flight were successful in repairing the spacecraft's attitude control system, allowing the spacecraft to continue its original mission. The astronauts also were able to repair the electrical box on the SMM's coronagraph. The repair mission was timely; scientists reported that in April and May there was a great deal of solar flare activity, including the largest flare observed since 1978.

Project scientists report that, barring unforeseen problems, the spacecraft should be able to continue its monitoring activities

through 1990 before its orbit begins to decay. In addition, mission scientists intend to use the SMM spacecraft to observe Comet Halley. During January through March 1986, Comet Halley will be at its closest approach to the sun. Although the comet will be very difficult to observe from the earth at this time, scientists hope to get a good look at it with the SMM spacecraft.

El Chichón: Stratospheric Chlorine

Two atmospheric scientists have discovered that about 40,000 metric tons of chlorine were injected into the stratosphere during the eruption of the El Chichón volcano in Mexico in March and April 1982. According to the National Center for Atmospheric Research (NCAR), never before had chlorine in the stratosphere been conclusively traced to volcanic sources.

The NCAR scientists who made the discovery, William G. Mankin and M. T. Coffey, said the principle source of stratospheric chlorine was previously believed to be man-made fluorocarbons from activities at the earth's surface. The presence of natural sources of stratospheric chlorine may change the overall view of the chemistry of the ozone layer.

According to the scientists, "The observation that a single, large volcanic event can increase the stratospheric hydrogen chloride burden by 40% over a large part of the globe should lead to a reassessment of the role of volcanoes in stratospheric chlorine chemistry." Previous data collected by Mankin and Coffey over a 5-year period indicate that stratospheric hydrogen chloride has been increasing by about 5% per year, apparently from man-made fluorocarbons. The scientists reported their findings in the October 12 issue of *Science* magazine.

The USGS, in cooperation with more than 800 state and local agencies, routinely gathers information on the quantity and quality of the nation's surface and groundwater resources at more than 80,000 sites across the country.

Valles Caldera Research Opportunity

Last year we had 16 Life Supporting Members and just over 100 Individual Supporting Members. This year we have 25 Life Supporting Members and close to 200 Individual Supporting Members. This growth is a very satisfying trend; can you help us sustain it? A list of your colleagues who are supporting members will be included with the renewal notice that you will receive shortly. In addition, close to 40% of the membership have donated \$10 or more in the last 3 years in response to our request for a voluntary contribution. Thanks to everyone who has done so, and to our others; please help us increase this percentage to more than 50 this year. Voluntary contributions from so many members are a demonstration of appreciation for the Union and help us when we appeal to outsiders.

The GIFT Steering Committee and its parent committee, the Financial Resources Committee, are now actively pursuing contributions from the other organizations of members. This effort was launched successfully by one of the Corporate Supporting Members of AGU, a company of less than 50 employees, which donated \$8000 without even a request from AGU. The well was drilled to a total depth of 856 m, and an uncalibrated bottom hole temperature of 160°C was reached. Core recovery is reported better than 95%. Hydrothermal alterations include clays, calcite, quartz, pyrite, and chlorite from the volcanic rhyolite down to total depth. The intensity of alteration increases with depth and/or along major fractures and faults.

The casing is filled with fresh water, and

investigators intend to run thermal gradient logs periodically until May or June 1985.

Those interested in obtaining more detailed information or submitting proposals for research should contact Fraser Goff, Los Alamos National Laboratory, ESS-1, Mail Stop D462, Los Alamos, NM 87545.

The GIFT

Steering Committee and its parent committee, the Financial Resources Committee, are now actively pursuing contributions from the other organizations of members. This effort was launched successfully by one of the Corporate Supporting Members of AGU, a company of less than 50 employees, which donated \$8000 without even a request from AGU.

The \$270,000+ dirt is now in the Fund

looks very good. The GIFT plaque

AGU headquarters now recognizes 32 individual

one Benefactor who has contributed \$10,000,

three Sustaining Members at \$5000 each,

and 21 Life Supporting

Members at \$1500, plus seven others

who have contributed between \$1000 and

\$1500. The committee is now encouraging

them to increase their previous contributions and pledges to reach the next level

on the plaque. However, there are only 30

members on the plaque; it is much more

important that the 15,000 members who

are not listed consider whether they could

reinvest in AGU some of the dividends

that they have earned in geophysics. A

pledge of \$800 per year over 5 years will

make you a Life Supporting Member.

AGU needs a significant reserve.

The day that the mortgage can be paid off is

drawing nearer, and a number of committees

have made suggestions for uses of the

income from the GIFT Fund that would

have direct benefit to the membership.

Necessless to say, the GIFT Fund

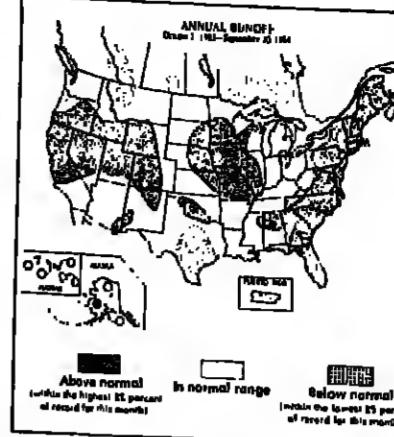
Steering Committee will continue its strong efforts

to increase the size of the fund, but only

you can assure their success.

Charles L. Drake

President



country has experienced a 2-year wet trend. During the 1983 water year, 48% of the same key index stations had flows that were well above average and only 6% reported well below average flows.

In October 1983—the first month of the 1984 water year—high streamflows were reported in most of the nation, with 90% of the key index stations reporting average to well-above average streamflows. The water year ended on a similarly wet note with 80% of the 174 stations reporting average to above average flows for September 1984.

As a further indication of the generally healthy state of the nation's water resources for the 1984 water year, the combined flow of the three largest rivers in the conterminous United States—Mississippi, St. Lawrence, and Columbia—was 786 billion gallons per day (bgd), 21% above average for the water year. The three large rivers drain more than half of the lower 48 states and serve as a convenient check on the status of the nation's water resources.

The USGS, in cooperation with more than 800 state and local agencies, routinely gathers information on the quantity and quality of the nation's surface and groundwater resources at more than 80,000 sites across the country.

Law/Science Professorship

Columbia University has established a new professorship in law and science in its School of Law. The position, the Julius Silver Professorship in Law, Science, and Technology, is said to be the first chair of its kind at a major law school and was made possible through a gift of more than \$1 million. Silver, a graduate of Columbia Law School, is a New York attorney.

Forum

Acid Rain

Comment

I have read Dr. Lester Macchia's article, "Acid Rain: Controllable?" (Eos, November 29, 1983, p. 958) and do not want it to go unchallenged.

The final paragraph of the article is hard to justify. I know Dr. Macchia, and I think he knows many of my friends, and we are firmly of the opinion that we know enough to justify political action to reduce sulfur emissions now. We also know how to reduce them. Certainly we, as scientists, should work on the residual uncertainties, but in my opinion these are being used as an excuse for inaction politically and do not constitute a valid reason for no action.

The suggestion that a large and expensive field experiment be mounted is surprising in view of the fact that there have been two that have already been done and are well documented. The first was the COMINCO smelter in Trail, B.C., where before World War II the sulfur emissions had made the town and the surrounding country a moonscape. Damage was also claimed by U.S. farmers south of the border. The smelter was referred to the IJC, which found COMINCO at fault, awarded damages, and ordered the company to clean up their act. The company did and Trail, B.C., is now a beautiful garden city.

The second example is Sudbury, Ontario. The changes in that city upon the bringing into service of their very high stack are a matter of record.

Finally, I suggest that several of the questions raised by Dr. Macchia have already been answered to a sufficient extent by the work done in Sweden and elsewhere in Europe.

To Dr. Macchia's "Scientists, politicians, environmentalists, and industrial managers" I recommend the translation by Simon Harper of the report published by the Swedish Ministry of Agriculture for the 1982 Stockholm Conference. It is available from Liber Distribution, 162 89 Stockholm, Sweden, at a cost of 57.50 Krona. It is good reading prepared by a group that have done their homework. The title is: "Acification Today and Tomorrow."

P. D. McTaggart-Cowan
Bracebridge
Ontario POB 100, Canada

Reply

Dr. McTaggart-Cowan's letter states as a fact that enough is now known to take appropriate action to alleviate the trans-boundary acid rain issue. Others have stated equally as a fact the diametric opposite. I agree that some pollution control measures have already been taken with no more certainty than exists for the acid rain issue. But the costs to society were far smaller than for sulfur dioxide controls. In effect, science only plays part of the role in decisions about environmental protection, and my own personal, proenvironmental views, which might be shared with you, may not be shared by others.

To address one specific criticism of my article in your letter, may I remind you that the analogy between the long-range transport of acid materials and the Trail smelter problem is not of a nature to substitute it for a modern field experiment. Second, the Sudbury shutdown failed to produce decreases in acidity or sulfate deposition in 1978 and we are still looking into the longer shutdown in 1982-1985. I would criticize my own proposal for a study of deliberate source variation because some versions of this experiment might take a very long time to achieve and in the meantime we are making a decision not to control emissions while we wait.

May I thank you for the reference of the Swedish report, which I shall try to obtain and read.

My last remark in the article pertains to the fact that I neither asked for nor received a clearance for my letter, and at the time it was prepared I do not believe that the United States had formulated the policy expressed by the President and Mr. Ruckelshaus.

Lester Macchia
Air Resources Laboratory
NOAA, Rockville, MD 20852

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USGS hydrologists noted that much of the

Classified

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Sponsored Research Staff Member: Sponsored Research Staff position is available in the Department's Earth Resources Laboratory. Duties include interpretation of logging data for non-standard uses such as fracture detection and mechanical properties; development and test response models for crystalline rock; environmental rock tests and permeability studies; development and maintenance of the MIT-ERL well-blogging software. Requirements: MS degree in geophysics plus a minimum of two years field experience in the well-blogging industry required. The successful candidate should be familiar with seismic signal processing theory and interpretation, logging, experience with multi-wire statistical methods, and be very helpful. Operations experience and the desire to work in a research-oriented environment are essential.

Send resume (including salary requirements) to Mr. Kenneth Chin
 Personnel Office, K10-238
 Cambridge, MA 02180.

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Physical Oceanographer: The Woods Hole Oceanographic Institution plans to make a tenure track appointment as Assistant Scientist in the Department of Physical Oceanography. Applicants should have a degree in Physical Oceanography or a closely related field, and a record of original research. A candidate's area of expertise in oceanography is not specified, but a working knowledge of fluid dynamics is an important qualification. Please send resume to: The Personnel Manager, Box 54P, Woods Hole Oceanographic Institution, Woods Hole, MA 02543.

An equal opportunity employer M/F/H.

Massachusetts Institute of Technology: Haystack Observatory/VLB Radio Astronomy: Haystack Observatory invites applications for a one year term appointment, renewable for a second year, for a recent Ph.D. recipient in radio interferometry. Applications should have an enthusiastic interest in the study of extragalactic and galactic radio sources through VLB.

The successful candidate will be expected to carry out a research program both independently and in collaboration with Haystack, LBL, and, while currently research projects will include millimeter-wavelength VLBI, the experimental and stable compact sources, and radio maps. A significant fraction of the researcher's time will be devoted to support of Observatory activities, including processing and postprocessing of data from the Mark III Correlator or possibly to support of U.S. VLB Network observations.

Please write, enclosing resume, to: J. T. Karaku
 Assistant to the Director
 Haystack Observatory
 Westford, MA 01882.

EPI Engineering & Science: EPI Engineering & Science, a growing and successful firm providing professional and technical services to industry, wishes to make several additions to its geological/hydrogeological staff. Entry level through project manager positions are to be filled. Relocation to Grand Rapids, a recent All-American city. Reply in confidence to: EPI, 811 Cascade West Parkway SE, Grand Rapids, MI 49506.

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Postdoctoral Fellowship/Coastal Marine Scholar: The Marine Sciences Research Center invites recent Ph.D.'s as candidates for a postdoctoral research position in any aspect of marine science, coastal zone management, or related disciplines.

Two years of academic rear stipend \$18,400 for monies will be provided and scholars are encouraged to pursue their own research interests. Stipend and support start in September 1985. All requirements for Ph.D. must be completed by June 1, 1985. Submit resume, detailed statement of research interests and three letters of recommendation by February 15, 1985 Dr. J. Kirk Cochran, Marine Sciences Research Center, SUNY Stony Brook, Stony Brook, NY 11794-3000.

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Massachusetts Institute of Technology: Haystack Observatory/Atmospheric Sciences: The Haystack Observatory is accepting applications for anticipated Atmospheric Sciences faculty for a one-year period, equivalent to a postdoctoral appointment, starting in fall 1985. The position will be provided and scholars are encouraged to pursue their own research interests. Stipend and support start in September 1985. All requirements for Ph.D. must be completed by June 1, 1985. Submit resume, detailed statement of research interests and three letters of recommendation by February 15, 1985 Dr. J. Kirk Cochran, Marine Sciences Research Center, SUNY Stony Brook, Stony Brook, NY 11794-3000.

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Postdoctoral Research Scientist/Lamont-Doherty Geological Observatory/Columbia University: The physical oceanography grant has an opening for research on assimilation of observational data in numerical models of the tropical ocean. The work is part of a larger effort with the long-term goal of developing prediction models for interannual climate variations, especially those associated with El Niño and the Southern Oscillation. A Ph.D. is required. The ideal candidate would have knowledge of physical oceanography, numerical weather prediction, applied mathematics, and control theory. A strong background in one of these areas is required.

Send curriculum vitae and the names of three references to Dr. Mark Cane, Lamont-Doherty Geological Observatory, Palisades, NY 10564. Lamont-Doherty is an equal opportunity/affirmative action employer.

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Senior Research Scientist/Colorado School of Mines: The Geophysics Department, Colorado School of Mines, is opening in 1985 for a Senior Research Scientist. The duties of the candidate will be to conduct empirical research in the use of potential fields methods in exploration and to train graduate students with diverse research projects which are already in progress. The candidate should have a Ph.D. and a minimum of five years experience in potential fields; some experience would be an advantage. Please send applications and inquiries to Dr. Norman Martini, Acting Director, Center for Potential Fields Studies, Geophysics Department, Colorado School of Mines, Golden, CO 80401.

The Colorado School of Mines is an affirmative action/equal opportunity employer.

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POSITIONS AVAILABLE

University of Utah Structural Geology/Tectonics: The Department of Geology and Geophysics at the University of Utah seeks a candidate for a tenure track position in structural geology or tectonics or tectonophysics. It is anticipated that this position will be filled in the assistant professor level, but applications by more senior persons will be considered. The position requires a Ph.D. with emphasis in structural geology, regional tectonics or tectonophysics. The ideal candidate will have the opportunity to teach in the areas of his/her specialty and may also be assigned initial teaching duties. The successful candidate will be expected to establish a vigorous research program involving graduate students, advanced topics in tectonics or tectonophysics, and application of structural geology to problems in western Colorado. There is an excellent opportunity to collaborate with other faculty in structural geology, sedimentology, geophysics, geochemistry and petrology. A vita, copies of publications, names of three persons that may provide references, and a letter outlining the candidate's research and teaching interests should be sent to Dr. William P. Nash, Chairman, Department of Geology and Geophysics, University of Utah, Salt Lake City, UT 84112-1185. Deadline for receipt of applications is December 31, 1984 with the appointment starting in September 1985.

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Seismologist/Ohio State University: The Department of Geology and Mineralogy, The Ohio State University, invites applications for a tenure track position for a seismologist with research interests in crustal geology and/or tectonics. The ideal candidate will be prepared to assist in teaching introductory geophysics courses, advanced topics in tectonics, crustal research, and supervise graduate students. Postdoctoral or industrial experience is desirable. Rank and salary commensurate with experience and research record. Please send application to Dr. Jer-Ming Chiu, Department of Geology and Mineralogy, The Ohio State University, Tennessee Seismic Information Center, Memphis, TN 38192.

Applications must be received by December 10, 1984.

Ohio State University is an equal opportunity/affirmative action employer.

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Computer Manager/Microcomputer Specialist: Memphis State University seeks a candidate to manage the PDP 11/44 and a major facility expansion to include a superminicomputer and a VAX 11/785 cluster dedicated to research applications in atmospheric sciences and geophysics. Hardware and software are designed for digital seismic data acquisition, digital seismic data processing, and graphical representation of geological and geophysical data.

The candidate must have at least a BS degree in Computer Science, Electrical Engineering or related field; three years programming experience in Fortran, Basic FORTRAN and ASSEMBLY; knowledge of various computer hardware and two or more widely used operating systems; ability to perform numerical data analysis. Knowledge of PASCAL and C languages and RMX and IIM operating system will help. Salary is negotiable depending on qualifications. Applicant should submit a resume, copies of academic transcripts and the names, addresses and telephone numbers of three references to Dr. Jer-Ming Chiu, Department of Geology and Mineralogy, The Ohio State University, Tennessee Seismic Information Center, Memphis, TN 38192.

Applications must be received by December 10, 1984.

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NATIONAL SCIENCE FOUNDATION (NSF)

Assistant/Associate Program Director Biological Oceanographic Program

NSF's Division of Ocean Sciences is seeking candidates for the position of Assistant/Associate Program Director for the Biological Oceanography Program. The position is excepted from the competitive civil service and will be filled by July 1985 on a two year rotational or temporary appointment under the provisions of NSF's Rotator Program. The per annum salary ranges from \$30,000 to \$45,000 for the Assistant Program Director and from \$35,000 to \$55,000 for the Associate Program Director. Normally, the candidate receives a leave of absence from his/her employer and salary is set in accordance with NSF Circular 187, Rotator Program. Overtime salaries for temporary employees are set at NSF's GG/GH schedule (equivalent to GS 14/15). The program supports fundamental research into the biology of the oceans. The incumbent will provide technical expertise in proposal evaluation, administration of research grants, program planning and budgeting. Applicants should have a Ph.D. in oceanography or marine biology, or equivalent experience. In addition, for the Assistant Program Director, 3 to 4 years of successful scientific research beyond the Ph.D. is desirable and for the Associate Program Director 4 to 6 years of successful scientific research experience is required. Experience in an academic research institution is highly desirable, as is at-sea and/or laboratory experience in biological research. Applicants should refer to Announcement Number EX 85-4 when submitting resumes (including current salary) to the

National Science Foundation Personnel Administration Branch

Rm. 212

1800 G St. NW.

Washington, DC 20550

Attn: Catherine Handle.

For further information call 202/357/7840. Hearing impaired individuals should call 202/357-7492.

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Middlebury College/Metamorphic Petrologist.

The Department of Geology seeks a metamorphic petrologist with an interest in tectonics. The regular tenure-track position in the fields of geology or tectonics is available in September 1985. Special emphasis will be given to applicants with a strong background in metamorphic petrology and/or tectonics. The regular tenure-track position requires a Ph.D. and is required. Rank and salary will be determined by the individual's qualifications and experience.

The 4-month department maintains active research and an ongoing field and lab program with students in tectonics, petrology, and geochemistry. Teaching responsibilities normally include 5 semester-courses, a 1-month winter term course, and supervision of senior research. The department has a teaching load of 12 hours per week, and includes a research laboratory and an automated electron microprobe.

For advertising information, contact Robin E. Little, advertising coordinator, at 202/432-2188. Advertising must be submitted to the mid-September issue and must be consistent with the scientific and educational goals of AGU and is subject to approval by AGU. Advertisers and their agents assume liability for all content of their advertisements and for any claims arising therefrom against the publisher. Offers of employment are subject to all laws and are valid where prohibited.

Texas Tech University/Geophysicist or Geologic Seismologist. The Department of Geology and Geophysics invites applications for a new tenure-track position in structural geology or tectonics. Candidates will be expected to carry out an active research program in their field of interest and to assume responsibility for teaching responsibilities at the undergraduate and graduate levels. A Ph.D. is required. The position will be available fall 1985. Applications should send curriculum vitae, list of publications, statement of research interests, and names of at least three referees to Peter Hudleston, Chairman, Department of Geology and Geophysics, Texas Tech University, Lubbock, TX 79484.

Texas Tech is an equal opportunity/affirmative action employer.

For advertising information, contact Linda Williams, Sigma Data Services Corp., a M/A-COM Co.

Telephone: 800-432-6035 or 432-2188.

Applications should include a resume, statement of research interests and names of three references to Dr. Edward F. Thorson, Department of Geosciences, School of Earth and Atmospheric Sciences, Texas Tech University, Lubbock, TX 79401.

For advertising information, contact Linda Williams, Sigma Data Services Corp., a M/A-COM Co.

Telephone: 800-432-6035 or 432-2188.

Geochemistry. The University of California, Davis, will be a permanent, tenure track, faculty position at the assistant professor level beginning Fall, 1985. Candidates having interests in isotopic geochemistry and/or the geochemistry of economic deposits are especially encouraged to apply but other specialists in geochemistry will be considered. A Ph.D. degree is required. Responsibilities include teaching at the undergraduate and graduate levels, and research in geochemistry.

Applications should be complete with a statement of research and teaching interests and the names of three referees. Deadline for application is January 15, 1985. Inquirer and application should be directed to Dr. Howard W. Day, Department of Geology, University of California, Davis, CA 95616. The University of California is an equal opportunity/affirmative action employer.

Coastal Physical Oceanographer. The College of Marine Studies invites applications for a tenure track position in physical oceanography. Applicants should have a background in coastal or estuarine physical oceanography, with experience in observational work at sea. The successful applicants will have the opportunity to develop an independent oceanographic research program which may include carrying out physical oceanographic research within existing interdisciplinary research programs in Delaware Bay or the adjacent continental shelf. Facilities available include the 120-foot coastal research vessel Cape Henlopen. Teaching at the graduate level will be required, and the successful candidate will be expected to teach introductory courses in physical oceanography to graduate students. It is anticipated that the appointment will lie at the assistant professor level, but applications from more senior persons are welcome. Applicants should send curriculum vitae, permanent reprints and the names of three referees to the chairman of the search committee, Dr. Richard Gosselin, Oceanography Program, College of Marine Studies, USGS, University of Delaware, Newark, DE 19716. (302) 461-9160. The closing date for applications is November 30, 1984.

The University of Delaware is an equal opportunity/affirmative action employer.

Sedimentologist/University of Illinois. Applications are solicited for a tenure-track position at the Assistant Professor level in sedimentology. A creative individual is sought who will develop a research program that complements existing programs in sedimentology (currently emphasizing source properties), geochemistry, tectonics, and/or climatic change. An excellent research environment and outstanding facilities are available both in the Department and the University. A Center for Super Computer Research and Development is presently being formed at the University. In addition, our campus is the site of a proposed regional computational facility. Opportunity exists to interact with the department of Theoretical Geophysics. Applications should be submitted by December 15, 1984.

Professor Albert C. Hsuir
Department of Geology
University of Illinois at Urbana-Champaign
1501 W. Green Street
Urbana, Illinois 61801.
Tel: 217/335-7732 or 353-3542.

The University of Illinois is an equal opportunity/affirmative action employer.

Assistant Professor—Isotope Geochemistry/The University of Minnesota. The Department of Geology and Geophysics at the University of Minnesota, Minneapolis, invites application for a 3 to 5 year position at the level of Assistant Professor in Isotope Geochemistry beginning Fall 1985. We are seeking someone with a Ph.D. and preferably some postdoctoral experience, an individual who will be active in research and teaching in addition to the operation of an existing solid-source mass-spectrometer laboratory. The geochemistry program at Minnesota emphasizes in microchemistry and will include some emphasis in planetary and terrestrial sources of hydrocarbons, hydrogeology and limnology. The holder of this position is expected to continue this tradition in addition to cooperating with or complementing the existing geochemistry research programs in aqueous geochemistry, stable isotope geochemistry, and noble gas geochemistry, particularly in the areas of isotope genesis, rock-water interaction, and mantle evolution.

Please submit a letter of application and attach a curriculum vitae, a statement of research and teaching interests, a list of publications and the names of three referees. Address your correspondence by February 28, 1985, to Emile Ito, Department of Geology and Geophysics, University of Minnesota, 100 21st Avenue S.E., Minneapolis, MN 55455.

The University of Minnesota is an equal opportunity educator and employer and specifically invites and encourages applications from women and minorities.

Assistant Professorship in Observational Coastal Dynamics/University of North Carolina. Chairperson of Marine Sciences, Morehead City. Tenure track position for physical scientist with interests in nearshore continental shelf and/or estuarine. Application to be received by July 1, 1985. This will be a research position, carry a minimum state supported salary commensurate with experience. The appointee will be expected to develop and carry out a field program in nearshore circulation. This person will be staffed at a research laboratory where programs related to coastal dynamics are underway. These programs include studies of sediment dynamics, wave run-up, diurnal tidal changes, planar patterns and lateral dynamics. He/she will also interact with faculty and students in an academic Curriculum. In Marine Sciences at Chappell Hill Faculty in this unit conduct research on carbonate platform geology, Gulf Stream dynamics and sediment/water chemical exchanges.

Selected applicants should send a letter describing their research interests, a brief curriculum vitae and names of three referees to Dr. Frank J. D'Amato, Director Institute of Marine Sciences, 3407 Arendell Street, Morehead City, NC 28557 by January 4, 1985.

The University of North Carolina is an equal opportunity/affirmative action employer.

University of South Carolina. Two year postdoctoral research assistant position anticipated. Person should have a strong background in structural geology and completely deformed regions along with an interest in geologic mapping and integration of diverse data sets. Position will be available starting date as early as January 15, 1985. Closing date for applications December 31, 1984. Applications with vitae, interests and possible references should be sent to Prof. Robert D. Fairber Jr., Department of Geology, University of South Carolina, Columbia, SC 29208.

The University of South Carolina is an affirmative action/equal opportunity employer.

LEADER, ATMOSPHERIC AEROSOL SAMPLING AND ANALYSIS GROUP

Ames Research Center (35 miles south of San Francisco) is seeking a senior investigator and leader for the atmospheric aerosol group. The group develops and flies advanced instruments to investigate specific problems, such as stratospheric-tropospheric exchange, the composition of the natural and perturbed troposphere, atmosphere-biosphere interactions, and climatic effects of aerosols and clouds.

Specified qualifications include: 1) Ability to advance, advocate, and defend programs. Ability to motivate, develop, evaluate, and recruit subordinates. Knowledge of current theories regarding important atmospheric aerosol problems and the relevance of measurements to these theories (double-weighted); 2) Ability to direct and conduct all phases of research projects that advance the state of knowledge of atmospheric aerosols; 3) Ability to design and develop state-of-the-art aerosol sampling/sensing instrumentation within cost and time constraints; 4) Skill in communicating schedules, plans, scientific goals, and operational constraints involved in flight missions. U.S. citizenship and Ph.D. or equivalent in atmospheric physics or chemistry are required. Permanent position in federal service. Projected salary: \$44,430 to \$67,940 commensurate with experience/education. For further information regarding requirements and application procedures, write 71-84A at the address below or phone (415) 694-5776. Formal applications must be filed by January 20, 1985. An equal opportunity employer.



National Aeronautics and Space Administration

Ames Research Center
Moffett Field, California 94035

SOLAR PHYSICIST — BRANCH CHIEF

SPACE SCIENCE LABORATORY NASA—MARSHALL SPACE FLIGHT CENTER

Huntsville, Alabama 35812

The Solar-Terrestrial Division expects to appoint a solar physicist to the position of chief of the Solar Science Branch. The Branch's fifteen members (six Ph.D.s), visitors (NRC post-docs, summer faculty, etc.), contractors, and associates are involved in an active research program in solar physics. A broad range of research topics is being pursued at present, with emphasis on the formation and structure of the transition region, the occurrence and consequences of distorted magnetic fields and their accompanying electric currents, and numerical modelling of coronal evolution and interplanetary dynamics. Branch activities include the operation of a vector solar magnetograph, the analysis of data from the Ultraviolet Spectrometer and Polarimeter (UVSP) instrument aboard the Solar Maximum Mission Satellite, and the assisting of MSFC engineers with the scientific aspects of solar missions (e.g., Sunspot, Advanced Solar Observatory and Pinhole/Occluder Facility). In addition, x-ray telescope development work is underway. Computing facilities are currently being upgraded and soon will be unsurpassed anywhere. Collaborations with extramural colleagues are encouraged, and there is the opportunity to train and advise graduate students.

The appointee must be a recognized research scientist with administrative talents. In addition to performing his or her own research, the appointee will be expected to guide the work of the Branch and to pursue new directions as appropriate. It will be the responsibility of the Branch chief to recruit new Branch members, post-docs, and visitors as opportunities arise. The Branch chief will oversee the submittal of proposals for funding and will be expected to work closely with the Office of Solar and Heliospheric Physics at NASA Headquarters. Salary will be GM14 or 15 (42,926 - 65,642) depending on experience and qualifications.

* Forward resumes and references to the following address no later than January 15, 1985.

Dr. C. R. Chappell
ES51
NASA/Marshall Space Flight Center
Huntsville, AL 35812



U. S. Citizenship Required

Equal Opportunity Employer

Ph.D. Fellowships/Louisiana State University. Applications are invited from prospective Ph.D. students in all fields of geology and geophysics for fellowships in the Department of Geology, Louisiana State University. The stipend, funded by Arco Exxon, and the L.S.U. Alumni Endowment, ranges from \$10,000 to \$13,500 per year; the awards are annual basis and are renewable for up to three years. One of the benefits of these fellowships is a reduction of tuition and fees to about \$10,000 per year.

Application forms, transcripts, GRE scores, and three letters of recommendation must be received by March 15. For the Alumni Endowment Fellowships, however, the Departmental deadline for receipt of application package is January 7.

Application materials and further information on the graduate program can be obtained from:

Dr. Michael J. Hayes
Department of Geology
Louisiana State University
Baton Rouge, LA 70803-1010.

Louisiana State University is an equal opportunity/affirmative action employer.

SERVICES, SUPPLIES, COURSES, AND ANNOUNCEMENTS

A publication is invited from prospective Ph.D. students in all fields of geology and geophysics for fellowships in the Department of Geology, Louisiana State University. The stipend, funded by Arco Exxon, and the L.S.U. Alumni Endowment, ranges from \$10,000 to \$13,500 per year; the awards are annual basis and are renewable for up to three years. One of the benefits of these fellowships is a reduction of tuition and fees to about \$10,000 per year.

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Dr. Michael J. Hayes
Department of Geology
Louisiana State University
Baton Rouge, LA 70803-1010.

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Groundwater Contaminant Transport Modeling. The course, to be held January 29-31, 1985, at Princeton University, Princeton, N.J., aims to provide hydrogeologists, engineers, and professionals in related disciplines with the background in methods necessary to model groundwater flow and contaminant transport models. This course is designed for individuals involved in the development and application of groundwater models describing contaminant flow; participants should have a rudimentary understanding of partial differential equations and familiarity with FORTRAN computer programs.

The short course fee is \$495 (U.S.). This covers the text, \$50 in computer time, computer code and documentation, and cocktail lunch. Inquiries should be directed to: G. F. Pinder, Department of Civil Engineering, Princeton Univ., Princeton, NJ 08544 (tel.: 609/452-1022). Please note that enrollment is limited. All proceeds from this course will be used for graduate student research support.

POSITIONS WANTED

Physical Oceanographer. M.S. 1983. Experience in hydrographic data acquisition and analysis in SW Atlantic and NE Pacific. Seeking a position as research assistant in academic institution, industry or government. R.M.C. 2835 Three Mile Lane, McMinnville, OR 97128.

STUDENT OPPORTUNITIES

Graduate Teaching and Research Assistantships in Marine Environmental Sciences and Coastal Oceanography. Opportunities for graduate study with graduate and research assistantships available for students interested in MS and Ph.D. degree programs in marine environmental sciences and coastal oceanography. Awards cover tuition and academic year stipends up to \$7,983. Additional summer support is also available up to \$3,000. Write: Graduate Program Chairman, Marine Sciences Research Center, SUNY Stony Brook, Stony Brook, NY 11794.

Meetings

Announcements

Tectonics

December 17-21, 1984. Tectonic Studies Group 15th Annual General Meeting, Swansea, U.K. Sponsor: Univ. College of Swansea. (Richard Lisle, Dept. of Geology, Univ. College, Swansea SA2 8PP, United Kingdom.)

This meeting will include 3 days of discussions of current research in structural geology, with poster displays and short lectures, during December 18-20. Workshops and field trips will take place on December 17 and 21.

ODP Drilling

February 20-22, 1985. Workshop on ODP Drilling in the Northeast Pacific, Seattle, Wash. Sponsor: International Northeast Pacific Activities Consortium (INPAC). Paul Johnson, School of Oceanography WB-10, Univ. of Washington, Seattle, WA 98195; tel: 206-543-8474.

Those interested in attending should contact the convenor (given above) before December 1, 1984.

The deadline for the submission of abstracts is December 31, 1984.

Suitable subjects for papers include mine hydrology, tailings disposal, contamination due to mineral resource waste, and mathematical models and field studies of these topics.

Meeting Report

Satellites Over Antarctica

Observations of the polar regions from space have led to significant contributions in a variety of scientific disciplines: geophysics, geodesy, geology, glaciology, meteorology, climate, oceanography, biology, and the physics of the upper atmosphere, ionosphere, and magnetosphere. Some results in these diverse fields were described in papers presented at the recent joint COSPAR (Committee on Space Research) and SCAR (Scientific Committee on Antarctic Research) Workshop on Satellite Observations of the Antarctic: Past, Present, and Future. Other results were presented at the COSPAR Symposium on Space Observations for Climate Studies and on Achievements of the International Magnetospheric Study. Each of these meetings was held during the 25th Plenary meeting of COSPAR, which took place in Graz, Austria, from June 25 to July 7, 1984.

In general, instruments aboard polar-orbiting satellites have measured properties of the earth's upper atmosphere and plasma environment in situ. Other instruments look down and "remotely sense" characteristics of the atmosphere and the earth's surface. Such observations, which complement observations made from the ground, have advanced our understanding of the earth's environment considerably.

Since 1975, five Landsat satellites have viewed cloud-free areas of the earth's surface from a height of about 900 km. Observations of 185-km² regions are made in two spectral bands in the visible region of the spectrum and also in two near-infrared bands. The Landsat data may be used to prepare black and white pictures, which are used for making accurate maps. Surface features as small as 100 m were revealed in the early Landsat images, and features as small as 30 m were seen in the more recent data. Alternatively, the data can be processed digitally, to produce better maps with scales of 1:10,000 or 1:250,000, and subjected to computer enhancement techniques. Information in the different spectral bands can be combined digitally to produce false color images, which reveal features that cannot otherwise be seen; for example, the geology of rocky outcrops in the Antarctic can be studied. Also, the "blue ice" area, where ice flow and surface ablation bring meltwaters to the surface, can be located. At low angles of solar illumination the shadows on the images highlight glaciological features. The images are especially useful for defining the position of the coastal ice margins and icebergs in the ocean. Some ice margins in the Antarctic peninsula are known to be retreating by up to 100 m yr⁻¹.

Studies of the 12-year satellite record of sea ice extent have shown substantial interannual variability and regional sea ice changes that have been related to changes in atmospheric circulation, but no long-term trend in the ice cover has been detected. Monitoring of the ice cover with passive microwave sensors and the systematic analysis of acquired data should both their operational utility and their scientific importance to several fields of research. The distribution of biological organisms, for example, and the circulation of the ocean are strongly influenced by the distribution and seasonal cycle of the sea ice cover.

Satellite-borne radar altimeters have much potential for ocean, climate, and glaciological research. Precise altimeters can observe large-scale oceanic currents, waves, ocean swell, sea ice boundaries, icebergs, surface elevation of the ice sheets, and ice shelf frontal positions. Although previous radar altimeters have only provided coverage to 72°S, and the most precise altimetric mission planned (TOPEX) will only go to 63.4°S, the radar altimeters on the European ERS 1 and the U.S. Navy N-Ross will provide data to about 81.5°S. Scientific

Meetings (cont. on p. 1190)

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Surveying

June 9-16, 1985. 52nd Session of the Permanent Committee of the International Federation of Surveyors (FIG), Katowice, Poland. (Kontakt Organizing PC 56, ul. Koszulna 10, Katowice, Poland)



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